ELECTRIC DEVELOPMENT AS AN AID TO AGRICULTURE

GUY E. TRIPP

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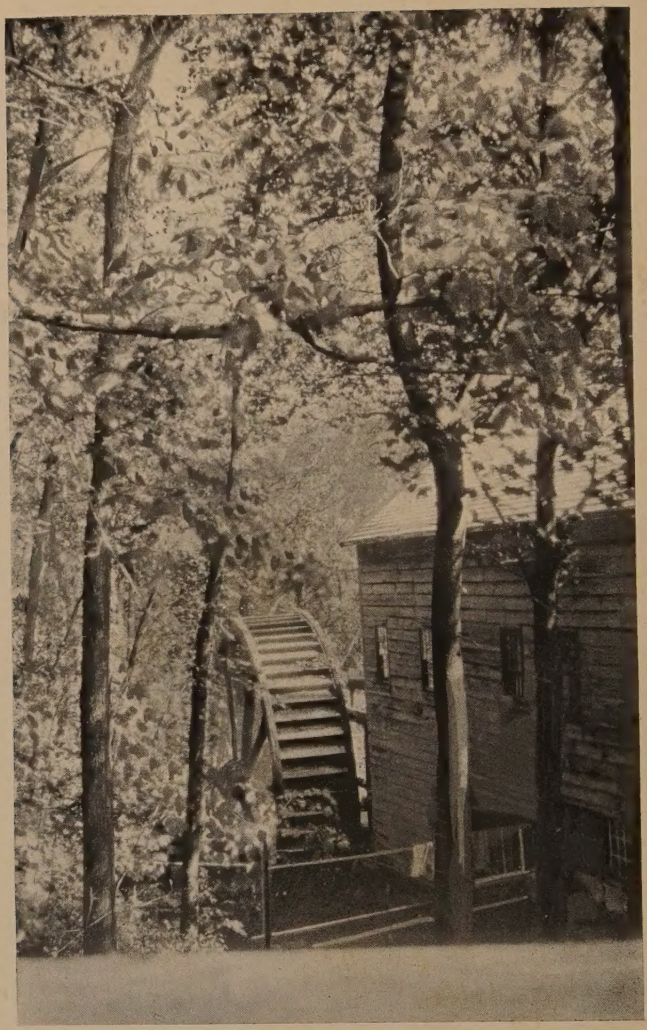

In the days of the old-time water-driven mill, agriculture and industry were closely allied.

ELECTRIC DEVELOPMENT AS AN AID TO AGRICULTURE

BY

GUY E. TRIPP

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Manufacturing Co.

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INTRODUCTORY

For many years the American farmer has not been as prosperous as he should be. Due to a variety of causes, some nation-wide and some world-wide, his economic position has become less favorable than that of the worker in most other great industries.

While this relative situation between farming and other industries appears to be an age-old and world-wide phenomenon, nevertheless in the United States the disparity is greater than it ought to be.

In this country we have placed industry upon a high plane, the like of which has never before been accomplished at any time anywhere in the world, and this is due to some extent to the adoption of specific national policies, such as our protective tariff system and our liberal patent system, which have tended to impose a burden of high costs upon the farmer while nothing has hitherto arisen in his field to compensate him for them.

The writer has entertained a hope that eventu-

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ally there would come some natural economic reaction which would work to the benefit of the farmer, because, if a reaction should take place naturally, that is to say for good business reasons, it would result in a sounder condition in agriculture and a better economic balance throughout the country among all industries than would be likely to follow the passage of laws as a remedy.

There are indications that such a natural development is now arising out of the present rapid extension of electric superpower systems, which are agents destined to affect profoundly our social and economic life, and one of the most important effects lies in the promise that they will encourage the dissemination of industries throughout the country. This would result in bringing manufacturing enterprises nearer the farmer, thus giving him and his family employment for their idle time and assisting him in the solution of the problem of distribution of his products by bringing his market closer to him.

The use of electric power on the farm itself is closely connected with the whole question, but the central idea which runs through the first four addresses in this little volume, which were delivered on various occasions during the past year, is industrial decentralization. Perhaps their pub-

lication may assist in arousing interest in the causes and effect of this evolution if it really is one, and if so in the extent to which it may be properly encouraged. The last address was included to give the reader a glimpse of some of the future possibilities of electric development.

As some readers may not fully understand the significance of "superpower" I quote the following as the best short definition of it that has come to my attention.

Superpower is a system for generating electric power in large volume by water and fuel at the most favorable locations for economy and reliability and distributing it over wide areas by great interconnected transmission systems.

Guy E. Tripp,
New York, 1926.

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I

POWER ON THE FARM

THERE is a wide-spread public interest in the reports that the farming industry is less prosperous than most of the other industries of the country.

If this is true, then it certainly becomes a matter of importance to everybody because there are over 6,000,000 farms in the United States and more than 30,000,000 people, or nearly a third of our population, live on them.

The trouble with the farming industry can be stated in a word, and that is it yields unsatisfactory profits. There have been various reasons given for this condition of affairs:

One, that the farmer is caught between the upper millstone of high prices for the things which he must buy due to special conditions produced in the main by our protective tariff system, and the nether millstone of low prices for the bulk of his products which are influenced

largely by the world markets where competition is free and unrestricted.

Another is that the high cost of distribution of his products in our home markets consumes too much of the margin between the prices which he receives and the prices which the ultimate consumer pays.

There are other things such as unsatisfactory farm labor conditions, lack of a system under which his products may be warehoused pending favorable market conditions, over-production, etc.

Any one, or all, of which may be factors in the situation.

The plight of relatively small margin of profits to the average farmer is a frequently recurring one, and in at least two outstanding cases the remedy which I am going to talk about has been successful in killing the patient, but I do not believe it will do so this time. I certainly hope not because, as they say down East, there is only one thing that can be cured after you kill it and that is a pig; a saying that I recommend to the earnest consideration of radical statesmen.

Apologizing for leading you back into ancient history, you will remember that one of the principal causes of what is popularly known as "The Fall of the Roman Empire" was the unfortunate condition of the average farmer brought about by

the employment of slaves on the large farms of the aristocracy which made it impossible for a free farmer to compete; and, again, coming down to our own day, perhaps the unfortunate condition of the so-called poor white in the South was brought about by precisely this same cause.

POWER AN IMPORTANT FACTOR IN IMPROVING CONDITIONS

Now, since I endorse the introduction of the slave on the farm as an important factor in the improvement of farming conditions in this country, it becomes necessary to point out the difference between the kind I recommend and the kind which has always brought disaster in its train. I approve the use of the power slave; and since electric power is the most convenient and flexible for many purposes, I shall specifically deal with electric power.

Of course, there are other forms of power also adapted for farm use—farm tractors, gasoline engines, and the like—and wherever I speak of the general virtues of power, I include machines of this sort, although we electricians hope to supplant some of them in time.

Of course, the farmer is too up-to-date to object to power on principle, but it might be well to say in passing that it was not so long ago that

the workman did object to the introduction of power into the industry on the theory that there would be fewer jobs to go around. He failed for a considerable time to recognize the fact that has now become commonplace, viz., that power simply increases the efficiency of man and does not supersede him.

This is a very simple proposition so far, but there are certain conditions which explain to some degree the reason why electric power on the farm is not already in more general use.

COST OF ELECTRIC POWER TO FARMERS

Not more than 3 percent of the farms in this country are receiving electric current from power lines, yet no one denies the desirability of electric service. This backwardness is largely due to the fact that farms are so scattered that long pole lines must be run in order to serve a limited number of consumers, whose total consumption is comparatively small, and a high investment per user is necessary. Hence farmers must pay (if they are to pay the cost of the service) relatively higher prices for electricity than those who live in thickly settled communities. So high, indeed, is this cost that many contend that the electrification of the majority of American farms is impossible.

I have no doubt that, if you engineers should apply your slide rules to this problem, you might very likely arrive at that conclusion; and I have no doubt that, if the bankers here present should apply their interest and amortization tables to the problem, they also might reach the same result.

It is with some timidity that I assert that your conclusions would probably be erroneous; and, having in mind the unceremonious manner with which engineers dismiss the scientific theories of laymen, I ask you to pause a moment before charging me off the books. Engineers are usually right, but they sometimes have a blunt way of saying so. There was one famous case.

About 1830 a respectable farm laborer in England named Hodges solved the problem of squaring the circle and demanded from the Chancellor of the Exchequer £100,000 which he understood had been offered as a reward for the solution; but, by the dictum of the engineers and mathematicians of the time, his discovery was repudiated and it has been lost to posterity.

However, Hodges to the contrary notwithstanding, I admit that mathematics is an exact science; but when you apply mathematics to economics you introduce human nature into the equation, and human nature is a large and exceedingly variable factor. There was a famous

case of that, too. It had to do with a matter of tax adjustments and was called The Boston Tea Party. I doubt very much if that historic occasion could be justified by a mathematical formula.

So, in dealing with the electrification of the farm, if I appear to run a little free, I hope you will be patient.

POWER INCREASES EFFICIENCY

Everybody knows, or should know, that the standards of living and wages of the world expressed in common purchasing power of money are almost in exact ratio to the amount of power placed at the disposal of the worker; but it is generally thought that high standards are due to the material operation of machinery itself without taking into consideration the effect of the machinery upon the mind of man himself; that is to say, the fact often overlooked is that the use of machinery and modern appliances has been a great influence in developing the masses of men into more alert if not more intelligent human beings.

While machinery is not a cure for laziness and incompetence, I imagine that Maud Muller's husband, dozing in a corner with his pipe and mug, would have been a much more energetic and effi-

cient individual if he had owned a Ford car; and perhaps Maud herself, if she had possessed a radio receiving set and learned to dance the Charleston, might have developed energy and resourcefulness enough to have landed the Judge.

It is to my mind indeed doubtful whether the high living conditions of our country rest more upon the development of machinery than upon the development of man. Perhaps it is a charmed circle and there is no answer.

Be this as it may, there has been a thorough application of power to practically all industries except the farming industry, and these other industries have forged ahead while farming has lagged behind.

If power has been an important factor in this process and conditions are such that the farming industry cannot also make use of power, it will be a pity because 30,000,000 people will not be contented to remain relatively underpaid hewers of wood and drawers of water for the rest of the nation. But I do not believe that agriculture must or will remain the only outsider in a power-driven world.

Some years ago economists proved to their own satisfaction that few farmers could afford motor cars. Trucks and light delivery wagons were conceded to them, but passenger cars to be

employed for the most part as luxuries were considered quite beyond the farmers' reach.

The facts of the matter are, however, that nearly three and a half million passenger cars were in use on American farms in 1924, and it was the human desire to make life easier, to secure pleasures otherwise unobtainable, that was chiefly responsible for the purchasing of these cars.

ELECTRICITY NOT AN EXTRAVAGANCE

If for much more practical reasons the majority of our farmers should adopt the general use of electric power on the farms, would it be an extravagance which they could not afford? I do not think so. I think it would tend to so improve and develop the man himself that out of the additional cost there would arise a profit from his greater alertness and efficiency.

Man is the all important thing in this world. Except for man, Pittsburgh would today be a wilderness filled with bears and woodchucks; and, in proportion as man supplements the pitiful power of his own muscles by an expanded and alert mind, so he surmounts all obstacles toward a higher standard of living.

I know enough about farming to realize that there is room for more efficiency in farm labor

and that better tools make better workers. It is human nature for a man to use a tool until it is almost blunt rather than to treadle a grindstone, whereas a switch on a motor-driven grinder invites his soul.

The life of the farmer's wife, through the use of domestic electric appliances and other conveniences, would be emancipated, and her spirit either improves or depresses the family.

Better living conditions on the farm would make it easier to obtain efficient labor during harvest time, and so on.

But these things are all details. The important thing is to place 30,000,000 people alongside the rest of us in use and effect of use of modern industrial tools and most important of all to stimulate them to take a more active interest in the movement of industrial decentralization which I venture to hope has set in in this country. There are indeed many indications of this tendency.

LOCAL INDUSTRIES WILL AID FARMERS

The most conspicuous example of it is the building up of the cotton spinning and weaving industry in the South.

A few years ago, the cotton grown in the South was shipped to New England and manu-

factured there, and cloth that the South needed was shipped back to them from New England. This process involved a large amount of transportation which, broadly speaking, was an economic loss.

If this tendency continues, there will be reaction against the powerful forces which are now at work tending to draw people away from farms and at the same time causing congestion in our industrial and commercial centers.

These local industries will certainly be more vigorously fostered by an inspirited farming population than by a depressed one, and to the extent that they are established they will furnish enlarged opportunity for employment of rural population.

Management of them can be so adjusted that with power-driven farms a minimum amount of time can be spent in that highly seasonal labor and the maximum amount find occupation in such local industries, and thus the farmer's family as a unit will work to much greater advantage than under present conditions.

CITIES SHOULD ENCOURAGE RURAL ELECTRIC SERVICE

Now, what all this talk amounts to is this: There is a great deal of work now being done

It is human nature for a man to use a tool until it is almost blunt, rather than treadle a grindstone; whereas a switch on a motor-driven grinder invites his soul.

looking toward the electrification of the farm; and, as I said in the beginning, the cost of the service may be high if the farmer pays the full cost at the beginning.

But is there any reason why, if it is necessary, he should not obtain his electric service for a period at lower prices than he would mathematically be entitled to receive and have the deficit for a time absorbed in the rates of the more thickly settled communities?

I have no hesitation in saying that it would be a good investment for this city to continue to pay its present electric rates a little longer than it otherwise would in order to encourage the construction of power lines to its surrounding farming district. Of course, I do not expect you to call a mass meeting and issue a protocol about it, but you can at least refrain from ejecting Public Service Commissioners from office because they permit it to be done. Ultimately, the service should stand on its own bottom and studies are being made with the aim of finding where the bottom is.

The National Electric Light Association, working in conjunction with leading farm organizations and other groups, has been working for a long time on ways and means of distributing and applying electric service to farming communities,

and many of the Public Utilities are aiding in this work.

For example, the Alabama Power Company has completed or authorized 117 miles of experimental lines to serve 1940 rural customers, and with the help of the State Agriculture Experiment Stations it is studying practical methods of applying electricity to agriculture with the object of determining the cost and value of electricity to farmers under present conditions, and developing new uses for electricity on Alabama farms.

Work of a similar nature is also in progress in other parts of the country. Thus exact data is being accumulated which, in time, will be of the utmost value in developing rural electrification.

SOCIAL BENEFITS OF ELECTRICITY ON FARMS

Now to conclude. If I have made myself clear, one of the large benefits of power on the farm is in helping along the decentralization of industry into more local enterprises which will tend to mitigate the seasonal unemployment of farming.

The function of power and modern improvements is to release a portion of our time for other profitable employment, not for loafing.

Home industries reached by good roads and

motor cars, power-driven farms, modern appliances in the home and a busy contented family unit would mean the American rural home has been re-established on a modern basis.

For a steady diet Omar Khayyam's paradise would not be a patch on that Utopia if as and when it comes. Meanwhile I suppose we shall keep on trying to cure the headaches that come from congestion by passing more laws and making more speeches; better speeches, it is to be hoped, than this one.

Nevertheless this one has a virtue not yet achieved by those of the future, in that it is ended, and I thank you for your patient attention to it.

II

THE FARM PROBLEM

QUITE a number of people are saying the agricultural situation is bad, but also quite a number of us from the farming district south of Fourteenth Street in New York have been saying it is not.

Some of us have been saying the trouble with the farmer is that he is not efficient, that he overproduces, that he has not deflated his land speculations in the boom war period, and anyway if he is, and doesn't, and has, nothing can be done about it because his prices are fixed in Liverpool, which is beyond the three mile limit of our jurisdiction.

Well, I thought you might not know any more about it than I did; so, in order to check up any off-hand objections that you might raise to the statements I intend to make, I went up to the National Industrial Conference Board, No. 247 Park Avenue, New York, to see what it had discovered about the farming situation as the result

of a long painstaking investigation which it has been carrying on.

When you get a fact out of the National Industrial Conference Board, you can leave it around almost anywhere and it will keep.

It is the only fact-finding organization that I know of that does not deacon its facts, it gives every fact in a problem a run for the money.

I shall tell you later a few of the things it says about agricultural conditions, but let me quote from it here in answer to the charges of inefficiency, over-production and failure to deflate.

FARMERS NOT INEFFICIENT

First, as to the efficiency or lack of it. By the introduction of farm machinery and improved methods "the labor required to produce a bushel of corn was reduced from 3 hours and 4 minutes in 1855 to 41 minutes in 1894;" there is no computation of a later date; but I think it probable there have been further reductions since that time. In the case of wheat "the time was reduced from 3 hours and 3 minutes per bushel to 10 minutes" during the same period.

It is, therefore, indicated that there has been a marked increase in efficiency in dealing with our two principal crops, without taking into ac-

count improved roads and motor vehicle transportation.

I don't know how it strikes you, but this evidence is enough to compel me to drop inefficiency as a major item in this particular discussion.

Next, about over-production; the report does not find it in the aggregate and further it says:

"The increase in agricultural products during the war period and the surplus in the post-war years were in large part only apparent * * * the increase in acreage of five cereals was made possible by reduced acreage in live stock feed."

But it is instructive to note that the 1925 wheat production and acreage was about the same as it was 25 years ago.

While maladjustment between crops probably still lingers, I find no evidence that general overproduction exists as a fundamental item in the farm problem.

Now comes the matter of deflation of land speculation during the war and the report says:

"The farmer did buy lands at high prices but with the exception of certain groups such as those owning lands in cotton producing areas farm land investors by 1924 had been forced to sacrifice about 20% of the pre-war values of their

properties and their income was sufficient to pay only 3% on the remainder."

I submit that, measured by industrial deflation, the farmer has been quite a considerable performer.

A GROWING PROBLEM

The comment that the prices of the bulk of our farm products are fixed by world markets is largely true, but that is only stating the existence of a factor in the problem; it does not solve it.

It is a factor, too, which is growing more difficult for "there is but little chance of our farmers competing in the world markets with the newer exporting countries where production costs are lower."

In view of all this and in order to make progress with this speech, let us therefore assume that this farm question is one that cannot be dismissed in a word, at least by any of the words to which I have referred; then I ask you—What are the basic elements of it?

I realize that, when we start flirting with the answer to that question, we are playing around the edge of very deep esoteric economics. But the worst that can happen is to fall in, and amuse

the professional economists; so, if you will promise not to hurl any formulas at me, I will start the discussion.

Somebody advised a young speaker in Parliament to always establish a number of islands in his discourse and then to swim gracefully from one to the other, but when he reached the last one to stay there lest he be drowned in his own oratory.

So I now establish three islands, namely—Industry, Public Service Corporations and Agriculture; and, if I may indulge in a small mixed metaphor, industry is monarch of them all.

THE ACHIEVEMENTS OF INDUSTRY

A great proportion of our vast governmental machinery has been created for or on account of industry. That some of it may be unnecessary is a matter of no importance in this discussion. However, the most rabid industrial reactionary will endorse the U. S. Government's activities in establishing a protective tariff system. On the other hand, while the multitudinous functions of modern government are to a large extent due to industry, industry pays at least its share of the expense, and it does more, it makes the country what it is.

The efficiency of industry in this country is incomparable.

It has by the use of power and machinery increased the productive capacity of workers many times, it has by concentration, consolidation and skill created vast plants and organizations, it has built great cities, and all this has been done because it could be done on a decreasing percentage of profit on the business turnover. It may be noted as a passing comment that a few swollen fortunes as an aspect of industry are of no importance here.

But please note for future consideration that industry hitches its wagon to the ultimate consumer for its guiding star, while the ultimate producer is only one of its expense items.

Now, instead of swimming gracefully to the next island, it is so close at hand that I can leap abruptly to it.

PUBLIC UTILITIES REDUCING RATES

Public Service Corporations cut no mean figure in their demands upon governmental machinery. I hope my public utility friends will understand that I use the word "demand" in its broadest sense.

This machinery may be too complicated and re-

pressive, but that I again repeat is of no importance in this discussion.

The utilities pay at least their share of the expense, and they have done more, they have made it possible for the country to function at all.

By their efficiency, organization and enterprise they have maintained high wages and at the same time constantly reduced the cost of service and rates, and their profits are restricted by regulation. But here again we find the same relative positions of the ultimate consumer and the ultimate producer, just referred to.

AGRICULTURE IS DIFFERENT

Now we come to agriculture, and we find it a bird of another color. It does not normally need complicated and expensive governmental machinery and it is not organized. It is an individualistic industry, but it is one of vast proportions.

The 6,500,000 farm enterprises are greater than all the other enterprises combined—industrial, mining, commercial and financial; and the average investment per farm was in 1920 $12,084.00 and "to a much larger extent than is true in Europe the farmer lives upon and owns his own land."

The total rural population in 1920, including

towns of less than 2500, was 51,406,017 or 48.6% of the total population, while strictly farm population was 31,614,269 or 29.9% of the total population. This is a "Vox Populi" that can be heard clear to the galleries when it becomes vocal.

It is already saying a good many things, but here are some of the things that the National Industrial Conference Board finds are true.

First, let me say that the people who live in New England, Middle Atlantic, Mountain, and Pacific States are in a very poor position to form a judgment in the matter because those sections furnish only about 15% of the improved farm acreage and much of that is favorably situated both as to character of crops and markets. Most of you inhabit the first two of these regions and therefore some of this information may surprise you; it did me.

SOMETHING HAPPENED IN 1900

While the stroke of midnight December 31, 1899, did not mark the precise beginning of the present agricultural era, nevertheless from about that time "until the beginning of the war the industry was faced with a tendency to markedly increasing costs per unit" with no corresponding increase in prices. This condition was interrupted

by war exigencies only to be since revived until in 1924 farm bankruptcies broke all records, increasing 1200% since 1910.

In other words, since 1900 our agricultural plant has been slowing up and running down as compared with other industries.

The participation of the farming industry in the total income of the nation has shrunk as follows:

1850	34.6%
1900	20.5%
1910	18.0%
1920	13.8%
1921	9.3%

In 1921 each person engaged in agriculture received about 43 cents for every dollar received by persons engaged in all other occupations, while the government employees and persons engaged in trade, banking and professions received $1.83.

The ratio of average annual earnings in the farming industry to the average earnings in other major industries is as follows:

Agriculture	$ 793
including food, fuel, rent worth about $650, leaving cash income of about $143.	
Manufacturing	1256

Transportation	$1572
Clerical workers	2142
Ministers	1678
Teachers	1295
Government employees	1650
Postal employees	1750
All other groups	1415

AGRICULTURE OUT OF STEP

However, I must not go on quoting figures because banquetters are an impatient lot; and anyhow, if I haven't already convinced you that the farming industry is out of step with other industries, I give it up as a poor job.

Be this as it may. I proceed to ask you why is agriculture out of step with other industries?

I wish you would answer the question; I am almost afraid to try. Can it be that this wonderful industrial system of ours is too heavy for its foundations? If so, can the foundations be strengthened?

Let me summarize. That the farmer's costs are high cannot be denied. He cannot for that reason successfully compete in the world market with other countries where costs are lower, and in the home market he is confronted as to the bulk of his products by an organized buyer whose guiding star is, I repeat, the ultimate consumer.

Organization is necessary because it takes ma-

chinery to distribute food and clothing to the people. There may be too much machinery; but, as it exists, it does not make inordinate profits, and it depends for its peaceful existence upon low prices to the consumer.

In a word, our industries are so well organized that one-third of our citizens—the farmers—appear to be bearing the heaviest burden of society.

This appears to be an injustice, but the difficulty of applying a remedy lies in the fact that two-thirds of the population benefit by our industrial system, and thus we find ourselves in a perfect dilemma.

But because we cannot see a clear and definite avenue of escape, it does not mean that we admit the case is hopeless. It simply means that we have a real problem on our hands.

A REMEDY IN SIGHT

The causes of great economic troubles are usually numerous and deep-seated and it is almost impossible to isolate and weigh them. Few of us are so gifted that we can accurately diagnose the disease and prescribe an infallible remedy and it is for this reason that legislation rarely succeeds in doing so.

But society usually solves its problems; if it did not, it would have disappeared long ago.

An authority on rural electrification states that a million American farms will be electrified within ten years.

Violence sometimes forms part of this process and in the early days of social development it was about the only practical method of changing existing conditions. But we have made progress in the past few centuries and the necessity for violent methods even in legislation is constantly diminishing.

We have also learned by experience that in many cases economic unbalance carries within itself the elements of its own cure, and I incline to the belief that this is one of the cases.

I believe we may have reached a point in our industrial development where its future course will naturally be in a direction which will help the present unsatisfactory balance between industry and agriculture, and that the extensive development of superpower systems will be the most important factor in the movement.

Agriculture was at the height of its prosperity some two generations ago when the country was dotted with rural districts which were to a considerable extent self-contained in the matter of home industries, but they went down under the pressure of modern industrial development.

But now we have reached a point where with good roads, motor vehicle transportation and electric power available at any point it is possible to re-establish the old-time rural district, but on a

different and larger scale; a district having 25 to 100 times the area could function as easily as those of two generations ago, and the industries will be specialized plants fitted into and made a part of our present efficient industrial system—not the little inefficient local work-shops of fifty or sixty years ago.

I am told by skilled factory managers that in most instances a manufacturing establishment employing not exceeding 4,000 people is more efficient than one employing a larger number.

Conditions are indeed now favorable to a distribution of industries throughout the country and electric superpower development makes it possible, and there is already in evidence a considerable movement in this direction.

If this goes on, it will be beneficial to the farming industry in that it will furnish employment to the rural population, which will tend to make the farmer's family part industrialistic and thus in some degree overcome his unfavorable position as a competitor with the industrial worker who works full time while the farmer's efficient work is intermittent due to the seasonal nature of his industry.

Going along with this there would naturally be an increase in the application of power to the farm industry itself, which would release some of

the time of the farmer's family unit and thus further increase the opportunities of employment in these local industries.

In brief, if there is a tendency, as I hope there is, toward distribution of industries, it would be, for the reasons I have stated and many others, one of the most important remedies which could be applied to our troublesome agricultural situation, and perhaps the largest factor in restoring the balance between industry and agriculture.

III

RESTORING THE BALANCE BETWEEN INDUSTRY AND AGRICULTURE

In presuming to address this audience on some of the phases of superpower development, I feel I ought to explain in advance that there are also some aspects of the subject which I shall not attempt to discuss.

I do not propose to waste your time in order to demonstrate that superpower systems are, in fact, developing at a very rapid rate, nor to analyze the reasons for the development; nor shall I enumerate the various advantages to the public to be derived from these systems. I shall also refrain from mentioning waterpower development, fuel conservation, the economies of mass power production, etc., etc. You gentlemen know all about these things; and, what is more, there is, so far as I have observed, complete unanimity of opinion, both inside and outside the electric industry, as to the main facts of superpower de-

Superpower Development in the United States today

velopment and its desirability from the standpoint of national welfare.

Nor shall I touch upon the subject of government versus private ownership of the electric utilities in its present status. It seems to me that the case is closed and that government ownership is, for the moment, dead as a political issue.

A GREAT NATIONAL PROBLEM

What I do wish to consider at this time, however, is a situation which represents one of the great problems now confronting the country, and I take the liberty of bringing it to your attention because I believe that superpower development is an essential factor in its satisfactory solution and because it may possibly revive public ownership agitation.

During the past twenty-five years the United States has, excepting for a few brief intervals, enjoyed exceptional prosperity. To mention merely three significant facts, our total national income increased within this period from twenty billion dollars to sixty-three billions; the earnings of individual industrial wage earners more than doubled; and the standard of living of the average family rose to an unprecedented level. Indeed, if one studies almost any of the statistics

relating to the United States as a whole since 1900, he will find progress and success pictured in the rosiest of colors.

NO AGRICULTURAL PROSPERITY

But, unfortunately, total figures do not tell the whole story. Were we to dig a little deeper, we would discover, to our surprise perhaps, that a group comprising one-third of our citizens and representing America's greatest industry — namely, agriculture—had by no means shared in this general good fortune.

On the contrary, as shown by a comprehensive report on the agricultural situation recently completed after a most careful study by the expert statisticians and economists of the National Industrial Conference Board, our farmers have been struggling for the past twenty-five years with constantly increasing costs and no corresponding increase in prices (except for a brief period during the war); bankruptcies among them broke all records in 1924; the participation of the farming industry in the total income of the Nation fell from 20% in 1900 to 9% in 1921; and in 1921 each person engaged in agriculture received only 43 cents for every dollar received by persons engaged in all other occupations. In a word, since

1900 our agricultural plant has been running down.

This is a serious matter. Compared with it, all of our other social, political and economic troubles seem to be relegated to second place. If our farming population is not prosperous, it will be discontented; and discontent among so large a number is not only unfortunate in itself but is bound in time to make itself felt in ways that will affect other more fortunate industries.

To remedy a trouble, we must first determine its true cause. Why is agriculture out of step with other industries?

Many reasons are given, any or all of which may be factors in the situation; but, among them, the following seems to deserve special consideration.

The farmer must pay high prices for the things he buys, as indeed everybody else does, but because of these high costs, he cannot sell his products with satisfactory profits in the world markets where he must meet the competition of other countries where costs are lower, and in his home market he as an individual is confronted as to the bulk of his products by highly efficient organizations whose guiding principle is to buy at the lowest price and to pass the benefits on to the consumer. This is a natural and perfectly

honest process, but to the farmer the picture is that most of our industries are so well-organized that they are passing the heaviest burden of society on to him.

What is the remedy?

LEGISLATION NO REMEDY

For the moment, the attention of our political leaders is directed to certain bills now before Congress. I shall, however, take the liberty of leaving them out of this discussion. Legislation is rarely a cure for economic ills. It has, on occasion (as in the case of the Federal Reserve Act) removed definite obstacles to the interplay of economic forces, but never have laws created prosperity where it does not exist, except by taking it away from others. We can, of course, bring a semblance of prosperity to the farmers by taxing all other classes of citizens for their support, but no permanent good could be thus secured, and much harm would certainly be done.

In presenting to you some views which appear to me to have some bearing on the solution of this problem in which superpower has a large influence, I would like to use New England of a generation or two ago as an illustration.

NEW ENGLAND IN 1870

Though Nature has been somewhat niggardly with New England in matters of soil and climate, she was very generous in another respect—she scattered waterpowers with a lavish hand throughout this district. Many of these waterpowers were put to work at an early period and, as a result, most New England farms of 60 years ago lay within reach of some busy little industrial center.

The farmer took his wheat to the local grist mill, his calves to the local slaughter-house, and his wool to the local carding mill, and had his raw materials turned into usable goods on the spot. He bought his cart from the local wagon works and his churn from the local wood-working factory. And not only did these establishments supply his material wants, but they provided a market for his products and also gave employment to those of his sons and daughters who, for one reason or another, were not engaged in farm work and, in addition, offered him employment during the slack periods of his own highly seasonable occupation. Thus the typical rural community of New England at that time was largely self-contained and economically independent of the rest of the world.

But the wheel turned. Improvements in railway transportation and the increasing efficiency of large industrial plants closed down the little local industries. The farmer suddenly found that he was no longer self-sufficient. To fill many of his wants, he now had to buy the products of outside manufacturers; and to get the money for this purpose he had to sell his own products in a country-wide and a world-wide market. Then the machine that exalted manufacturing and commerce and depressed agriculture got started and, as a crowning misfortune, his children and his best workers, attracted by the high wages and diversions of the industrial cities, left the farm.

But the wheel is showing signs of making another turn. The centralization of industry has apparently gone too far.

OVER-CENTRALIZATION

Take, for example, a large industrial city which contains scores of factories and employs thousands of people. As these factories grow, congestion increases until a point is finally reached when newcomers find it impossible to obtain satisfactory homes in the city itself except at prohibitive prices, and the transportation facilities

from outlying points become intolerably overcrowded. Wages, therefore, begin to increase, but without benefitting the wage earners because their expenses likewise increase.

Under these circumstances considerable economies for both industry and wage earner can be secured by establishing relatively small unit plants in the small towns of the rural districts. Not only are new sources of labor thus opened up, but production costs can be reduced, certain managerial difficulties can be minimized, and the workers can live comfortably and more inexpensively within easy reach of the plant.

Mr. Henry Ford is an ardent advocate of this policy of industrial decentralization. "In the America of the future," he is quoted as saying, "there will be no teeming tenements in which millions of people are cooped up within a few square miles of territory. Instead, the country will be traversed by chains of small towns clustering around individual factories and inhabited by people who will divide their time between the factory and the farm. Instead of the men coming to the city, we are taking the work to them out in the country. Improved transportation methods have made that possible and the process will be more and more feasible as transportation facilities grow."

DECENTRALIZATION STARTING

While labor conditions form the most important factor favoring decentralization, others are also influential, such as the reduction in rent and taxes, nearness to sources of raw material, and so on.

The outstanding example of the operation of these forces is the building up of cotton manufacturing in the rural districts of the South, but equally instructive is the dispersal of the printing industry from its stronghold in New York into towns as far west as Ohio. Another centralized New York industry—the furriers are apparently beginning to follow the lead of the printers, and other typical urban industries will possibly do likewise. California is already dotted with small industrial plants and it is not improbable that many of the great manufactories of the Atlantic Seaboard and the Middle West will care for their growth in small unit plants, each devoted to the production of certain standardized parts.

Under present conditions the farmer's family usually has no alternative between working on the farm and going to the city, which means that either the family as a unit will be uneconomically employed for the greater part of the year (and, therefore, poorer than it should be) or else it

must be broken up. But, if industrial decentralization takes place on a wide scale, conditions resembling those in New England of the old days will obtain throughout vast areas now solely dependent upon agriculture,—with this difference, that because of motor cars and good roads the radius of accessibility of each industrial center will be increased from 5 to 10 times, which means an increase in the area of from 25 to 100 times. Countless farmer's families will then have the choice of a variety of occupations and will be able to realize the full measure of their earning capacity without disrupting home life.

Furthermore, decentralization of industry will help the farmer in another and quite different way.

BRINGING ELECTRIC POWER TO THE FARM

Electric superpower systems are vital to industrial decentralization. Without these systems, industries will not spread out into the country, regardless of advantages to be secured by doing so, but will remain in congested centers. But wherever superpower systems are well developed, power can be secured almost anywhere, and decentralization is then free to take place. Hence, as superpower systems grow, small factories will multiply in the rural districts.

Electric power and the automobile are bringing industry back into touch with agriculture by multiplying small-town factories like this one.

Now, the chief obstacle to the electrification of our farms is the high cost of bringing electric service to them. It usually does not pay to tap a high-tension line and build a low-tension line to take care of the relatively small demand of a few scattered farms, but it frequenty does pay to do these things to serve an industry; and, when once a service connection is made and a line is built, neighboring farms can then be supplied with electric power at reasonable cost.

To cite a specific case, a group of southern farmers applied to their electric power company for service, but were told, after investigation, that this could not be supplied unless a nearby cotton-gin could also be included. The farmers called on the owner of the gin, with the result they got what they wanted.

Hence, as small factories multiply in the rural districts, more and more farms will be electrified.

No one questions the great value of electric power to the farmer. Give the farmer electric power at a reasonable cost, and he can immediately relieve himself and his family of a large portion of their burden of labor, reduce his costs, make his profits more certain, and, what is of equal importance, raise his standard of living to a level corresponding to that of the city dweller, which will improve the morale of his family, help to

keep his children at home, and make it more easy for him to secure efficient labor when he needs it.

ADVANTAGES OF INDUSTRIAL DECENTRALIZATION

To sum up, the decentralization of industry will enable the farmer to broaden the earning capacity of his family, increase the business value of his farm, and make his home more attractive. It appears, indeed, to be the most promising, if not the only practical influence that will bring agriculture back into step with other American industries and restore prosperity to it. If this can be done, it will mean the elimination of discontent and radicalism from a large and influential proportion of our population, thereby greatly strengthening the political and economic structure of the country.

But all of this is dependent upon electric development, and electric development is dependent upon the wisdom of the leaders of the electric power industry.

These leaders, therefore, bear a heavy responsibility. To them the country must look for a development which will bring about a great social and economic readjustment. So much is involved in the electrification of the rural districts—it means so much to industry, to the farmer, and to

Superpower development is bringing electricity to the farm.

the Nation as a whole—that this undertaking may be regarded as the primary duty of the electric power industry. Here, indeed, lies the present frontier of electric progress.

But, if the people expect these things of the leaders of the electric industry, they must also realize that no one else is so competent to accomplish them. Only men of the widest knowledge and experience in electric matters, skilled in creative work and guided at every step by economic considerations, can succeed.

No government body—State or Federal—can do it effectively. The driving force of all government effort is political expediency, and political expediency is a poor tool when applied to economic problems.

IV

POWER AND ITS DISTRIBUTION

LAST spring, acting upon a suggestion from the British Prime Minister, the London "Daily Mail" sent to the United States a group of eight industrial workers to investigate "what the methods are that enable the American workmen to enjoy a better standard of living than any other working people in the world, to produce more, and at the same time to have so much higher wages."

The mission spent six weeks in the United States, traveled 5000 miles, visited 42 industrial establishments, and gathered much illuminating information. But they found the answer to their problem in the very first plant they entered, for there they saw men working "as the directors of machinery instead of the slaves of human muscle." Said a member of the mission, a practical foundryman, after watching a man making molds with the aid of power-driven machinery, "In England a man doing the same job would work twice as hard, do half as much, and earn half as much."

That remark clearly illustrates the value of power. Power increases man's ability to produce those useful and desirable things that are essential to our welfare. Power is, in fact, the very foundation of our civilization. So feeble are a man's muscles that, unaided, he is barely able to keep himself alive. The more power a nation properly applies to production, the more prosperous are its people. But where there is no power, the people are always close to starvation.

POWER ESSENTIAL TO CIVILIZED LIFE

The pioneers who first endeavored to settle upon these shores had actual experience with life without power. Though they were surrounded by the most bountiful gifts of Nature, they were unable to utilize them adequately. They lacked power to build suitable shelters, clear the forests, cultivate the soil, collect sufficient stores of fuel, and protect themselves from savages.

Sixty-seven of the hundred and five original settlers at Jamestown, and forty-four of the hundred and two passengers on the Mayflower, perished during their first winter, and only by the most heroic efforts did the remainder secure footholds here.

It is, indeed, very doubtful whether civilized

white men could have maintained themselves on this continent by their own unaided efforts. At all events, our ancestors did not attempt to do so for any length of time. Very shortly after the actual establishment of the first colonies, power in the form of horses, oxen, and negro slaves was introduced; and thus equipped, the colonists were able to establish permanent homes.

However, they could do but little more. Though these people were perhaps the fittest in all the world to carry on a pioneer existence, and though they had at their disposal unlimited resources, they were miserably poor for more than a century and a half.

WITHOUT POWER, THE PEOPLE ARE POOR

Grinding poverty is the inevitable lot of the average man where everything needful must be made by hand. It is difficult for the modern American to appreciate this, for history as ordinarily written tells us little about the people. We read much about the doings of monarchs, warriors, and great men, but unless we are curious about such matters we read almost nothing of the multitudes whose sweat and blood maintained the fortunate few in economic idleness.

But picture to yourself a state of affairs where

practically everything you need—house, barn, tools, clothing, furniture, and domestic utensils—must be fashioned from the rawest of materials by the hands of yourself or your family, and you will realize that at the end of a life of the hardest toil, you will possess very little and that, for the most part, of the poorest quality.

So small is the earning capacity of the ordinary man under these conditions that in 1774 the average wage in the colonies was less than $2.00 per week; and according to Prof. J. B. McMaster, "only by the strictest economy could a mechanic keep his children from starvation and himself out of jail."

SAMUEL SLATER, THE FOUNDER OF AMERICAN PROSPERITY

But the old order—the order that demanded exhausting toil to produce the necessities of life—was passing away.

In 1789, Samuel Slater landed in this country with every detail of the new English cotton-spinning machinery photographed on his brain. He built in Pawtucket, R. I., a spinning mill which was operated by horses, but later waterpower was utilized for this purpose. Following Slater's example, power was soon applied to the manu-

facture of other products, and then America began her transformation from a land of destitution into one of abounding wealth.

Because waterpowers were scattered throughout New England, this district saw the beginnings of manufacturing by power in America; and every New Englander benefitted by the fact that means had been found for increasing production with reduced labor.

Capital, trained business men, and laborers found employment in the new mills; consumers were able to secure many needed articles with less labor than was formerly required; farmers found new markets for their produce as the mills multiplied in the wilderness; and everyone profitted from the increased earning capacity of many who previously had no margin to purchase anything but absolute necessities.

PROSPERITY IN THE WAKE OF THE STEAMBOAT

Thus, power brought prosperity to New England; but, where power was lacking, there was still poverty. Take the settlements along the Ohio River in the early part of the nineteenth century as an example. Here were rich farm lands and timber and minerals in abundance, but what could

the settlers do with these things beyond keeping themselves alive?

The one outlet for their products was the Ohio-Mississippi River system, on which goods could be floated down to New Orleans by means of rafts. But the rivers could not be navigated in the reverse direction with any craft much larger than canoes, so that little of importance could be brought back. All necessary manufactures, such as tools, guns, and ammunition, had to be transported by horses from the east over the Allegheny Mountains. As a result, the settlers received little for their output and paid all the traffic would bear for their supplies.

But power, in the form of the steamboat that could ascend a river as well as descend it, removed the restrictions to trade and opened the doors of prosperity for this entire region. In 1815, the first steamer puffed up the Mississippi, and by 1819, Cincinnati had sufficient population to secure a city charter.

In the South, the most inefficient form of power ever used regularly by man—the negro slave—brought wealth to a small minority, but interfered with the introduction of better forms of power. Hence, the South as a whole remained comparatively poor until power in a new form became widely introduced.

THE INDUSTRIAL REVOLUTION

Waterpower as used in these early days was, of course, directly connected to its work, and under these conditions, though far superior to hand labor, it had its disadvantages. It definitely fixed the location of the factory using it, and it could not be employed for transportation. The steam engine, however, is not thus limited, and its general introduction into the United States for manufacturing, railroad operation, and navigation brought about those great changes that constitute the Industrial Revolution.

Production per worker increased enormously. A flood of machine-made products of every description lightened the burden of labor in countless homes. Wages began that upward movement which has continued with accelerating rapidity ever since. Capital accummulated rapidly. The great reaches of the North American continent were laid open to habitation and its vast resources were made available for use. Cities sprang up wherever conditions were especially favorable for manufacturing or trade.

STEAM POWER BUILT CITIES

City building was, in fact, one of the outstanding features of this period.

The railroad and the steamboat are natural city builders. They make centralization possible by providing excellent long-distance transportation for raw materials and finished products; and they encourage it by making certain selected places of specially easy access.

Commercial interests promptly sought the strategic centers thus created, and they were followed by the factory, which was now free from the necessity of locating beside a waterpower.

The general rule is that population tends to move in the direction of better living. Therefore, with commerce and industry multiplying opportunities for workers at certain points, and with modern invention making rapid improvements in urban living conditions a drift of population away from our rural districts set in. In 1840, hardly 5 percent of our people were city dwellers, but in the census of 1920, over 50 percent were so classified.

ELECTRIC DEVELOPMENT GIVES AMERICA INDUSTRIAL SUPREMACY

In the latter part of the nineteenth century, a new power agency—electricity—came into existence.

Waterpower increased the prosperity of the

nation because it was more productive than manual labor; steam power caused a further increase because it was superior to waterpower; and electricity has still further added to our national wealth because it represents a marked advance over directly-applied steam power.

It has greatly increased the production per worker; it has multiplied our resources by permitting us to accomplish many things that were formerly impossible; it has improved transportation facilities, both urban and interurban; it has transformed our cities into veritable fairylands; and it has raised the standard of living to unprecedented levels.

Its use has, in fact, enabled the United States to gain the industrial supremacy of the world.

Most European countries are far behind us in electric development. Our superiority in this respect is largely due to the fact that in America electric light and power systems grew up without interference on the part of governmental authorities, and, while an excellent method of regulation by state commission was early introduced here, there was nothing in this country to retard electric progress.

Our workmen now have at their disposal an average of 3¾ horsepower per worker, which is about double that available to the workmen of

England, the next most highly developed nation. Herein lies the secret of why "the American workmen are able to enjoy better standards of living than any other working people in the world."

It has taken Europe many years to realize the immense gain in production that American industry has secured through the use of electric power, but she is now fully alive to the situation and we can look for rapid electrical developments over there.

But in the meantime, American progress is showing no signs of halting.

WHAT OF THE FUTURE?

But is this progress to be along the same lines followed during the past century? And if so, will the evils of our times continue to grow along with the good?

Will our cities grow ever larger and larger? Our streets more congested? Our slums more crowded?

Are our workmen to become more and more dependent upon highly specialized jobs and increasingly at the mercy of trade conditions?

Is the drain from our rural districts to continue? Is the position of our farmers to grow more and more unsatisfactory? Are they to be the

hewers of wood and drawers of water for those who find relief from manual labor by the use of power-driven machinery?

Are the interests of the various sections of our country to become more and more diverse? Are the social, economic, and political cleavages between city and country to grow broader and deeper?

If so, will our particular political institutions continue to flourish? Will not our industrial and commercial structure prove eventually too heavy for its agricultural foundations and give rise to radical innovations?

Were conditions today what they were in, say 1910, it would be a far-sighted man indeed who could sincerely give optimistic answers to these questions. All things at that time seemed tending in the direction of centralization, concentration, and specialization—there were few signs that the tide might turn in some other direction.

A NEW ECONOMIC ERA

Today, however, matters appear to be in a much more hopeful state. There are two recent developments, each involving applications of power, which in my personal opinion point in an encouraging direction. Inasmuch as power applied to

LAKE ONTARIO
The Good Roads of New York State. All points in the state (except in the Adirondack and Catskill Mountain regions) are accessible to automobiles

production and transportation has had a dominant influence on the nation in the past, I believe one is justified in expecting that these new power developments will usher in a new economic era in which many of the defects of the old will be rectified.

THE AUTOMOBILE

The first of these developments is automotive transportation.

After having built up a magnificent primary transportation system—the railroads—we have in recent years turned our attention to the development of a secondary transportation system of even greater proportions. Last year there were registered in the United States, 17,500,000 passenger cars and 2,500,000 trucks, with a total rated power of over five hundred million horsepower, which is several times larger than the total amount of power used for all other purposes in the United States. There were 500,000 miles of surfaced highways over which these cars could readily operate, to say nothing of 3,000,000 miles of plain roads, most of which are practical for automotive use.

To these cars we must add 650,000 tractors, with a total estimated rated capacity of 13,000,000 horsepower, and also the airplane and the

dirigible airship. I do not propose, however, to discuss aerial navigation, as it is as yet too new to evaluate its possibilities. I will only say that it promises to supplement the effects of other factors, about which I can speak with more confidence.

The motor vehicle is proving of the utmost value to the industrial worker. It is saving him an incalculable amount of time in getting to and from work, in receiving supplies, and in delivering finished products; and since much of the time thus saved is being devoted to production, our national wealth is being still further increased.

There is nothing novel in this, however. Every new application of power does the same thing. What is novel about the automobile is that, in marked contrast to the railroad, it is a decentralizing agency. To it, almost all points, whether urban or rural, within its radius of operation are of equally easy access. It can go and it can collect and deliver almost everywhere.

Were one to calculate the amount of territory opened up by the automobile for residential and industrial purposes, he would arrive at an amazing total, for if the radius of accessibility is increased by 5 miles, the area accessible is increased by 100 square miles. Florida, New Jersey, and Long Island—to mention only three conspicuous

instances—furnish examples of the automobile's ability to make waste lands useful.

SUPERPOWER

The second recent power development of importance is that known as "superpower."

Technically, superpower is merely an extension of well-established practices, but socially it is a new factor.

The first electric light and power plants were naturally located in congested districts where a ready market for their services was assured. Very quickly each system spread to the extreme limits of its community, but until recent years, power lines rarely passed outside these limits because the relatively small demands of thinly populated districts made the construction of lines through them unprofitable. Thus, the full benefits of electricity were for the most part bestowed upon populous centers, thereby intensifying the centralizing tendencies of steam power.

Today, however, the United States is becoming covered with a great network of electric power lines.

The reasons for this I shall not go into at this time because I believe the general facts of superpower development are fairly well known. The

main points are that there are now in existence in the United States over 100,000 miles of high-voltage transmission lines and that this mileage is increasing rapidly. We are, in fact, justified in believing that in the not too distant future, practically every habitable part of the country will be in reach of electric power service.

Power is, of course, essential to industry, and in the past, manufacturing enterprises have tended to concentrate at points which offered, along with other advantages, opportunities for securing abundant supplies of either fuel or reliable electric power. Under extensive superpower development, however, power will be widely distributed, and industries will be free, as far as power considerations are concerned, to locate, roughly speaking, almost anywhere.

DECENTRALIZATION

There are, as a matter of fact, many pressing reasons for the removal of industries out of congested districts. Rent and taxes can be reduced, living conditions for employees can be improved, discipline can be better maintained with less hardship to the individual, and raw materials can often be secured more readily. There is a widespread opinion among industrial men that the concen-

tration of manufacturing in large establishments has gone altogether too far; and, save in the case of certain industries which require the presence of large forces at one point, the typical factory of the future is likely to contain less than 3000 or 4000 people, with perhaps only a few hundred as an average.

The splitting up of large factories into numerous small units is made practicable by the recent advances in standardization and the interchangeability of parts. No longer is it necessary for every part of a machine or utensil to be made at one spot so that all can be fitted properly into the finished product. Standardized parts can now be made in quantity anywhere and assembled anywhere.

Given, therefore, economic pressure to decentralize, and means for its accomplishment in superpower, automobiles, and standardization, the ultimate result appears to be inevitable.

If industrial decentralization does take place, it will mean a check on the growth of our cities. Large cities there will always be, because there are many vocations that can only be pursued at strategic centers and many temperaments that crave crowds. But an analysis of the occupations of the city of New York indicates that a large part of its population might be located elsewhere.

To the industrial worker, decentralization should prove a God-send. The factory town, with all that it implies, will be replaced by the garden community. The cost of living, housing, and transportation, which now cuts so deeply into his income, will be greatly reduced. A new occupation—agriculture—will be opened to any member of his family with taste and aptitude in that direction. On the other hand, his industrial opportunities will not be reduced, for with his car or motorcycle, his freedom of movement to seek employment will be very great.

BRINGING AGRICULTURE INTO STEP WITH INDUSTRY

But what of the farmer?

Statistics are not needed to prove that agriculture has not shared equally in the prosperity enjoyed by American industry and commerce. It is patent everywhere that during the past century the flow of the tide has been away from our rural districts. There are numerous reasons for this, and most of them are connected with power developments.

One of the early effects of the Industrial Revolution was the closing down of large numbers of local industries by the more efficient centralized

factories. Many of our small towns, once the busy centers of American life, lapsed into drowsy inactivity.

This immediately restricted the opportunities of the farmer and his family for making a livelihood; and then it did more—it removed the markets for his products to distant points, and, by necessitating the services of many middlemen and much transportation and rehandling, it greatly increased the cost of distribution, to the farmer's detriment. Eventually, his chief customers were great organizations who bought at the lowest possible prices.

The improvement in agricultural machinery, which began in the middle of the nineteenth century, greatly benefitted the nation as a whole, but it helped to depopulate our countryside. Said the Director of the U. S. Census of 1890, "The average farmer can today, with sufficient horsepower, do with three men the work of fifteen men forty years ago, and do it better." The surplus farm workers, unable to make a living on the farm and finding few openings in the neighboring towns, were compelled to migrate to the cities.

Of course, the use of improved implements caused a corresponding increase in the farmer's productivity. But, in the meantime, the industrial

worker increased his production to a much greater extent, so that the farmer's economic position, though actually advancing, sank relatively lower and lower.

A similar change took place in the farmer's standard of living. The city dwelling of 1800, though perhaps much more richly furnished, had in it little of actual comfort that could not be found in any well-to-do country home. Indeed, owing to the extremely bad sanitary conditions of the city of that time, its filthy, unlighted, footpad-infested streets, and the difficulty in securing fresh foods, the balance of good living was decidedly in favor of the country.

But during the past century, scientific research and modern invention have not only remedied these defects of the city, but have created for it undreamed of conveniences, comforts, and luxuries. Country living has also improved, but by no means to the same extent, so that the balance is now in favor of the city.

All these things taken together have thrown agriculture and country life out of step with industry and city life; and, though our farmers are actually better off than they were fifty years ago, they are less prosperous than most other classes of Americans.

With perfect justice, the farmer is loudly pro-

testing against this state of affairs and is vigorously trying to find some way out. I personally think that he will be unable to do so through legislative fiat, although there are undoubtedly certain conditions that laws can remedy for him; but I firmly believe that he will find his lot greatly improved under the new order of things.

The coming of the automobile was the first sign of this new order to the farmer. In 1925, there were owned on farms in the United States, 3,900,000 passenger cars, 400,000 trucks and several hundred thousand tractors. The way in which the farmer is using this motive power to increase his production and make life more agreeable for himself and his family is too well known to need comment.

However, the more the farmer increases his production by the use of power-driven machinery, the fewer farmers will be needed to feed the nation, for man cannot increase his consumption of food indefinitely as he can his use of manufactured articles. This process will help individual farmers, but it will increase the tide of migration to the city unless something happens to counteract this tendency.

This counteracting industrial decentralization gives promise of having effect; and, if it does take place on a wide scale, it will build up our outside-

the-city population again, revive town life, and bring back that contact of industry with agriculture which was formerly so advantageous to the farmer.

Two years ago, no orthodox electrical man would have dared to prophesy the general electrification of American farms; but so rapidly is superpower development progressing that an undoubted authority on rural electrification recently stated that within ten years one million American farms will be supplied with electric service from central power systems. Give the farmer electric power at a reasonable cost, and he can relieve himself and his family of a large portion of their burden of labor, increase his productiveness, and improve his standard of living.

This last is of foremost importance because people will be loath to leave the city as long as it offers greatly superior living conditions. But superpower, the automobile, radio, and other developments are gradually reducing the disparity between city and rural life, and we can hope the balance will in time become more even.

The farmer of yesterday was a man of muscle, a swinger of the scythe. The farmer of today, thanks to the Department of Agriculture, the State Agricultural School and his own organizations, is becoming competent to carry on one of the most

highly technical professions in the world. The farmer of tomorrow will have at his disposal the same facilities and resources as the industrial worker; and, if he is equally progressive, he will bring agriculture back into step with industry.

THE RESULTS TO THE NATION

And what will all this mean to the nation?

It will mean that all classes of Americans will be able to turn their productive abilities to better account.

It will mean an increase in production per worker, and this means an increase in the wealth of both the nation and the average family.

It will mean a fuller use of one of our great natural resources—land.

It will mean greater economic and political solidarity. Much of the country will be part industrial and part agricultural, so that highly specialized sectional interests will tend to disappear, and political radicalism, which always results when a large number of people suffer the same economic ills at the same time, will become weakened.

From the standpoint of national defense, we shall be in an enviable position because of our excellent facilities for turning out rapidly, in an emergency, all vital munitions of war.

Transportation will be conserved by reducing the length of the hauls between producer and manufacturer and consumer. The reduction in the haulage of fuel, due to the general use of the electrical method of distributing power, will be another item in this same account.

I must not be understood to be prophesying a millennium when troubles will be no more. Far from it. The new era will bring plenty of troubles of its own; but at least they will be somewhat different from those that have afflicted us, and they will be tempered by greater material welfare.

I wish that I could see as clearly a certainty of spiritual gain for the nation, but that does not come from without. I can only say that mankind does appear to be slowly climbing toward some distant and unseen goal, and I know of no reason to despair of further progress on the part of the next generation.

Finally, is there a menace in these new developments? A possibility that we shall be building a gigantic machine which, like Frankenstein's monster, will destroy its creator?

In spite of numerous alarmists, I think we need have no fear. Man is infinitely greater than his works.

V

THE FUTURE OF NATIONAL ELECTRIC SERVICE

Somebody has said that a good speech consists of presenting a set of facts in a manner which permits the hearers to believe that the conclusion is their own. The difficulty with that definition is that the hearers may not all reach the same conclusion.

Therefore, I am going to inflict my own deductions upon you from time to time as my speech progresses to the end that, should any of you be on the wrong side when I am done, the fault will not be mine. My warrant for presuming to occasionally express my personal opinions lies in the subject of my address, which is "The Future of National Electric Service."

I have been engaged in different departments of this service practically all my business life and have a general idea of the great fund of electric

knowledge that has been accumulated, and I am convinced that as yet we make practical use of only a small portion of it.

Swift said that the reason a certain university was learned was that most persons took some learning there and few brought any away with them, so it accumulated.

We should feel humbled at the dullness of our comprehension and imagination when we reflect that the electric art still stands out beyond all others in the magnitude of the problems yet to be solved both as to its future uses for the benefit of mankind and the means of production and control of electric energy itself.

But the developments already achieved (beginnings only as they will yet prove to be) have demonstrated that electric power is destined to recast society—in fact it has already done so to a considerable extent.

ELECTRIC DEVELOPMENT DUE TO AMERICAN GENIUS

The application of electricity to industry is almost completely the product of American genius. It was begun by Americans and guided by Americans through the critical early stages and brought

by Americans to the present state of efficiency, and all this in the space of one generation of men.

Moreover, it is only within five years that the art has so progressed that it is now taking on aspects of a National Service, and the next few years will be a period of creation of larger and larger service systems and greater organizations which will serve large geographical areas, linking up distant water powers with huge steam stations favorably located.

It will be done because it must be done to meet the requirements of the people.

This irresistible tendency is generally understood by the public to be based upon the urge of sound economics, but the fear of mere size is now being added to the many arguments which are advanced in favor of government ownership or super restrictive legislation.

We are all familiar with the arguments upon these important subjects, and they usually have to do with such things as rates for service, rate of return upon invested capital, character or regulation by public utility commissions, etc., and it is necessary to keep on repeating these arguments because thousands of people who know about them die every day, and every day thousands of people hear about them for the first time.

But a larger aspect of the question, which in-

volves social problems unprecedented in all history, has not been adequately brought out.

I apprehend the reason for the slight stress, which has been laid upon this neglected phase, is that practical men of affairs have acquired the habit of either holding their flights of imagination in check or keeping them locked up in their minds as being interesting, but not profitable.

I am a practical business man myself, but I am at this moment dealing with a social question and making no attempt to write anything into this year's financial balance sheet.

In order to see the picture, we must first take a brief glance backward.

OUR LIVES CHANGED BY SCIENCE

The condition of the common people in this world remained practically stationary for all the thousands of years of recorded history until about 120 years ago; for example, a citizen of Rome could travel to Britain just about as quickly in 500 B.C. and by the same means as were still in use in 1800 A.D.

Then applied science appeared on the horizon of the world, but it was slow in rising.

Our own Federal Constitution in one of its many flashes of prophetic vision empowered Con-

gress "to promote the progress of science and useful arts by securing for limited times to . . . inventors, the exclusive right to their . . . discoveries," and the laws of 1790 laid the duty of granting letters patent upon the Secretary of State, Secretary of War and the Attorney General or any two of them.

The volume of applications increased but slowly and it was not until 1837 that it was found necessary to create a separate department, and even at this late date electricity was still slumbering as a purely abstract science in the great minds of a long list of distinguished scientists who were mainly European.

Nearly two generations more passed before the American electric era was ushered in by men whose great names are familiar to you, most of whom are now living; and, in the brief period of a young man's lifetime, has come an American development which has changed the course of the life of practically every man and woman in our country.

I include women with some timidity about the consequences. Only a day or two ago, while I was crossing the street in New York, one of them driving an electric automobile missed me—I think unintentionally.

I have a suspicion that on some occasion I have

claimed too much credit for electricity and too little for the vote.

Be that as it may, the question is—why should this country have taken the lead while the older and more cultured countries of Europe lagged behind? It was not because of any inferiority in the European scientific mind; quite the contrary. Europe had produced more great scientists and perhaps is still producing more than is the United States.

The real answer lies close to the surface. America took the lead largely because it did not have to overcome the inertia of governmental bureaucracy in making practical use of this new science.

The driving force of private initiative in the United States was not throttled by the policy of government ownership of Public Utilities, which on account of the peculiar properties of electrical energy were the sole agencies through which it could be made of service to the people.

There is no reason to think that under a government ownership policy we would have more readily adopted electricity than did the Europeans.

Who can safely predict that our people would vote an appropriation for a new installation which involved scrapping machinery already paid for merely because some engineers told them it would

be advantageous to do it, particularly in view of the fact that some other engineer would probably dispute the statement?

Fernando Wood, member of Congress from New York, was defeated for re-election because he voted for an appropriation of $25,000 to assist Morse in putting up a telegraph wire between Washington and Baltimore.

Your own imaginations will furnish you many other obstacles which political bureaucratic control would interpose to the development of a service so closely identified with a new and rapidly unfolding science.

However, if the secrets of electrical science are exhausted or nearly so, then the conditions of the past cannot be urged so strongly as a reason against future public ownership.

But let me assert such an assumption is unwarranted and repeat what I said at the opening of my speech, that the electric art still stands out beyond all others in problems yet to be solved; it is now, as it has been for a generation, a fertile field for the scientific imagination.

PROPHECIES THAT WERE FULFILLED

The conceptions of imagination, scientific or speculative, are always at least interesting.

You will remember in Bellamy's "Looking Backward"—a book written about 40 years ago—that the hero, Julian West, was mesmerized in a cellar sleeping chamber which he had constructed to keep out the roar of noisy Boston. The mesmerist went on a vacation and forgot his patient and he was not discovered until the year 2000, when an excavation was being made.

Next to finding that the appearance of Boston had actually changed, the greatest marvel that he encountered was in the drawing room of Dr. Leete, "when the tinkling of a bell was heard and a few moments afterward the voice of a man, at the pitch of an ordinary conversation with the effect of proceeding from an invisible person in the room." He was listening to Dr. Barton, a Boston divine of 2000 A.D., who was preaching a sermon in his church some blocks away.

West wasted 75 years. He could in 1925 have sat in his drawing room in Boston and heard by radio a concert being given at the Hotel Savoy in London.

A contemporary of Mr. West—Mr. Aronnax, in Jules Verne's "20,000 Leagues Under the Sea"—was standing too carelessly by the rail of the ship upon which he was a passenger when she collided with something like a whale and he was bumped overboard into a submarine upon which,

or rather within which, he was an involuntary but interested passenger. If he had waited a few years, he would have been spared the suspense of the plunge overboard by asking for a pass from the Navy Department.

Mr. H. G. Wells, in a book entitled "Anticipations," was called upon to face considerable ridicule because he expressed the opinion that by 1950 there would be produced heavier-than-air flying machines which would be effective in time of war.

Rudyard Kipling, writing at about the same time in his story "The Night Mail," operated a dirigible air service between London and Quebec. He dated the event in 2000 A.D.

WILL NIGHT BE ABOLISHED?

Following the lead of these eminent writers, I, too, am going to risk mentioning one or two of the future possibilities in the electric field and I shall indulge in nothing more extravagant than the examples which I have just cited were thought to be in their time.

The widest known electrical appliance is perhaps the incandescent lamp, but it is a most wasteful and extravagant form of the conversion of electricity into light. I say this in spite of the fact that we make them ourselves.

Only about 5 percent of the force which is ex-

The one electrical process which is fairly sure to survive indefinitely—the production of electricity from waterpower.

pended in an incandescent lamp is converted into light. Therefore, there is practically a clear field for research in this service alone, concerning which J. B. S. Haldane—the great English scientist of the University of Cambridge—says, "To light a lamp as a source of light is about as wasteful of energy as to burn down one's house to roast one's pork. It is a fairly safe prophecy that in 50 years light will cost about a fiftieth of its present price, and there will be no more night in our cities. The alternation of day and night is a check on the freedom of human activity which must go the way of other spatial and temporal checks."

The most modern and efficient steam turbine engine turns out about 16 percent of the theoretical power contained in the heat units of coal. Here is 84 percent of a field in which science may work, and who can say that some time, even in the near future, electricity may not be produced direct from heat, thus doing away with the use of the steam engine for that purpose.

Even tomorrow there may be discovered a cheap fool-proof and durable storage battery which would revolutionize the electric light and power industry by enabling it to store electricity as gas is now stored in a gas-holder or oil in a barrel.

WILL WIND BE THE CHIEF SOURCE OF POWER?

Concerning this, Mr. Haldane says that he thinks the power question in England may be ultimately solved somewhat as follows: "The country will be covered with rows of metallic windmills working electric motors which in their turn supply current at a very high voltage to great electric mains. At suitable distances there will be great power stations where during windy weather the surplus power will be used for the electrolytic decomposition of water into oxygen and hydrogen. These gases will be liquefied, and stored in vats, vacuum jacketed reservoirs, probably sunk in the ground. If these reservoirs are sufficiently large, the loss of liquid due to leakage inwards of heat will not be great; thus the proportion evaporating daily from a reservoir 100 yards square by 60 feet deep would not be 1/1000 of that lost from a tank measuring two feet each way. In times of calm, the gases will be recombined in explosion motors, working dynamos which produce electrical energy once more, or more probably in oxidation cells."

Up to this point I have mentioned only the possibilities which are now being hopefully sought by researchers and scientists, but these possibilities are by no means the ultimate. The imagination

can conceive a cold light obtained by activating certain substances by electric influence; as, for example, activating the paint on the walls of a room by radio waves.

Possibly the air may be so treated that it might take the place of the present conductors of electricity and magnetism.

WILL SYNTHETIC FOOD AVERT FAMINE?

As the population increases and presses upon the means of subsistence, electrical processes of producing food from the nitrogen in the air or from other substance may rescue future civilization from sinking to the economic level of Asiatic countries. The production of electricity direct from the heat of the sun or the interior of the earth may, by the elimination of wasteful steam engines, solve the heating problem of the future.

And to go the limit of my own fancies with a warning not to let it influence you to sell your electric securities, light, heat and energy may, in the distant future, be stored in some form and electricity not used at all. Phosphorescence, the glow worm and radium are indications of these possibilities.

With that flight I beg your permission to return to 1926 with the statement that there is, in

fact, only one electrical process which is fairly sure to survive indefinitely and that is the production of electric energy from falling water—hydroelectric power—the efficiency of which is high at the present time; about 90 percent of the theoretical energy of falling water can be converted into electric force, which leaves little room for improvement.

Electric science has, therefore, almost unlimited possibilities for future discoveries, and it is quite beyond the power of anyone to foresee what electric development will be like a generation, or even a decade, from now. We know, however, that the tendency in the past has always been in the direction of more power and greater welfare for all, and we have every reason to expect a continuation of this progress in the future.

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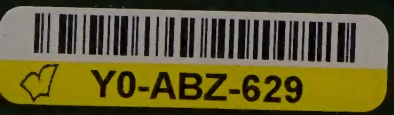
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